# LOUIS VICAT'S MEMOIR TO THE ACADEMY OF SCIENCES

*J. SALENÇON*

*Académie des sciences & Académie des technologies, Paris.*
*Institute for Advanced Study, City University, Hong Kong.*

## Louis VICAT

Louis VICAT was elected a Corresponding member of the *Académie des sciences* in 1833 and was then offered a full membership in 1850, a position he declined as it implied being able to attend the weekly meetings in Paris while he wanted to stay in Grenoble and take care of his brother Joseph.

The reason why the Academy decided to support this meeting devoted to the Future of Cement appears in the subtitle that refers to the 200th anniversary of the presentation to the Academy by Louis VICAT, a young engineer, of his memoir devoted to his *Recherches expérimentales sur les Chaux de construction, les Bétons et les Mortiers ordinaires*. This happened on the 15th of December 1817 as recorded in the *Annales de Chimie et de Physique* [1] (Fig. 1).

The present contribution, based upon the available original documents, will try to sketch out the circumstances that led to this memoir and its publication.

Louis VICAT was born in 1786 in Nevers where his father was a non-commissioned officer in the Royal-Piémont Dragoon regiment. His family moved to Seyssins near Grenoble where Louis VICAT spent all his youth. Thanks to a relative, Mr. CHABERT, who was a professor in Mathematics at Grenoble University, he could receive a good education but, at the age of 16, he decided to go to Toulon and board a ship as assistant wheelsman. He was soon back to Grenoble and fortunate enough, thanks again to the same Professor CHABERT, whom he called his uncle, to be introduced to the famous mathematician Joseph FOURIER, who had recently been appointed there as the departmental prefect. FOURIER, who had been a professor in Mechanics at the École polytechnique from 1795 till 1797, gave him the strong and good advice to prepare for the competitive examination and try to enter that prestigious institution. VICAT was successful and admitted in 1804.

After a two-year studying at Polytechnique, VICAT was admitted to the École des ponts et chaussées with training periods in the Apennines near Genova (Italy). Incidentally, browsing over the 16th volume of the *Causeries scientifiques* by Henri de PARVILLE [2], I recently found a paragraph where the scientific curiosity of the young VICAT – he was only 22 – was mentioned for his having noticed, during his many hikes in the mountains at the time, the influence of the presence of iron in the subsoil on the frequency of occurrence of thunderstorms (Fig. 2).

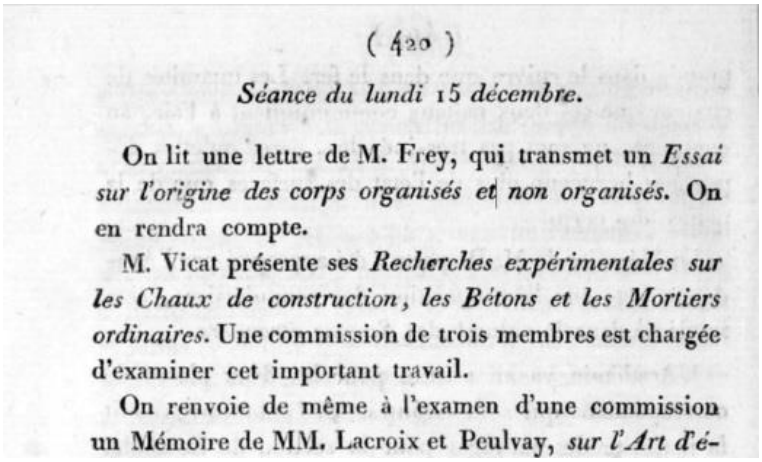
## The Souillac Bridge

In 1809 Louis VICAT was appointed as *Ingénieur des ponts et chaussées*, a civil servant, in the Dordogne department. Making the story short we jump to 1812 when he moved to Souillac (Lot department) after having been committed to the design and building of the Souillac Bridge on the Dordogne River. He would stay in that city for 20 years.

It may be noted that the decision about building that bridge had been taken, more than 20 years before, in 1786, but it had not been implemented due to political troubles, changes and lack of money. It then happened that, when returning from Spain in 1808, NAPOLEON passed through Souillac on the Imperial Road 23 and realised that a bridge over the Dordogne there was necessary.

The new decision was taken in 1812, again not such a good timing, and although the building of the bridge started in 1814, it was not completed until 1825 due to lack of money. It was to be a 9-meter wide and 180-meter long stone bridge, with 7 depressed arches with a 22-meter span and 8.33 meter rise. Six river piers and two abutments were to be built, whose settlements had to be monitored carefully of course (Fig. 3).

The torrential flow and the floods of the Dordogne River over a rocky bed made it very difficult to rely on the methods classically used at the time for setting the foundations of the piers (Fig. 4).



( 420 )

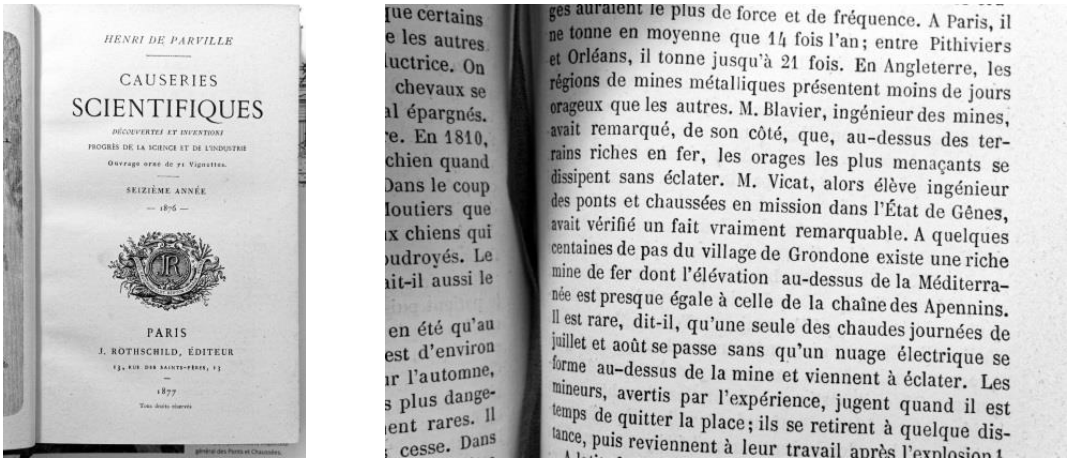
*Séance du lundi 15 décembre.*

On lit une lettre de M. Frey, qui transmet un *Essai sur l'origine des corps organisés et non organisés.* On en rendra compte.

M. Vicat présente ses *Recherches expérimentales sur les Chaux de construction, les Bétons et les Mortiers ordinaires.* Une commission de trois membres est chargée d'examiner cet important travail.

On renvoie de même à l'examen d'une commission un Mémoire de MM. Lacroix et Peulvay, *sur l'Art d'é-*

**Fig. 1:** ***Annales de Chimie et de Physique*****, vol. VI, p. 420**



HENRI DE PARVILLE

CAUSERIES
SCIENTIFIQUES

DÉCOUVERTES ET INVENTIONS
PROGRÈS DE LA SCIENCE ET DE L'INDUSTRIE
Ouvrage orné de 71 Vignettes.

SEIZIÈME ANNÉE
— 1876 —

PARIS
J. ROTHSCHILD, ÉDITEUR

1877

ges auraient le plus de force et de fréquence. A Paris, il ne tonne en moyenne que 14 fois l'an; entre Pithiviers et Orléans, il tonne jusqu'à 21 fois. En Angleterre, les régions de mines métalliques présentent moins de jours orageux que les autres. M. Blavier, ingénieur des mines, avait remarqué, de son côté, que, au-dessus des terrains riches en fer, les orages les plus menaçants se dissipent sans éclater. M. Vicat, alors élève ingénieur des ponts et chaussées en mission dans l'État de Gênes, avait vérifié un fait vraiment remarquable. A quelques centaines de pas du village de Grondone existe une riche mine de fer dont l'élévation au-dessus de la Méditerranée est presque égale à celle de la chaîne des Apennins. Il est rare, dit-il, qu'une seule des chaudes journées de juillet et août se passe sans qu'un nuage électrique se forme au-dessus de la mine et viennent à éclater. Les mineurs, avertis par l'expérience, jugent quand il est temps de quitter la place; ils se retirent à quelque distance, puis reviennent à leur travail après l'explosion.

**Fig. 2. Henri de Parville,** ***Causeries scientifiques,*** **vol.16, p. 279**

**Fig. 3. The Souillac Bridge**

The many delays imposed by money shortage had the positive outcome that VICAT could spend time in investigating and looking for materials best suited for a safe building of the foundations. This was the origin of a long series of experiments and observations, which resulted in the Memoir *Recherches expérimentales sur les Chaux de construction, les Bétons et les Mortiers ordinaires*.

## The Memoir

VICAT presented his Memoir in 1817, to the Academy of Sciences and to the *Conseil général des ponts et chaussées*, the French highest technical body in civil engineering, which had been created in 1804 after Trudaine's *Assemblée des Inspecteurs généraux* (1747). Looking for their criticism or approval, he had also written, as a kind of executive (or teasing?) summary, a 6-page note published in the *Annales de Chimie et de Physique* [3]. Both the Academy and the Council decided to review the Memoir.

The Academy appointed a committee whose members were DE PRONY, GAY-LUSSAC and GIRARD. Two months later, Pierre Simon GIRARD needed two successive weekly meetings of the Academy, on February 9 and 16, 1818 to present his report, quite a long one: it counted with 47 pages, out of which 32 were devoted to an exhaustive historical analysis showing that the reviewers – the three of them were also *Ingénieurs des ponts et chaussées* – were clearly aware of the "State of the art", while 15 pages dealt with the contents of the Memoir itself. The reviewers wanted the Academy to be fully informed about the whole context. The conclusion was quite positive and laudatory for the author who was commended for "despite living in a department far away from the capital city, having kept himself aware of scientific advances and being highly capable to derive useful applications" (Fig. 4). The Report was approved and its conclusions adopted by the Academy on the same day. It was published in 1819 [4].

On the Council side, BRUYÈRE reported on January 23, 1818 and the Council's approval was given by TARBÉ DE VAUXCLAIRS, GAYANT, DRAPPIER, LEPÈRE, DE PRONY, ROUSSIGNÉ and BÉRIGNY on the following day, with the advice to the administration that VICAT should be encouraged and helped in having the Memoir published and that the administration should then provide each of its *Ingénieurs des ponts et chaussées* with a free copy of it.

After these highly positive reviews VICAT was quite prompt in having his Memoir published by Goujon [5] It must be noted that the reference to a publication of the Memoir in the *Annales des ponts et chaussées* in 1818, that one may encounter in a biography and on the internet, is erroneous; (incidentally, the first issue of the *Annales des ponts et chaussées* appeared in 1831!)

The Memoir (Fig. 5) started with a dedication to Mr. CHABERT, and then VICAT proudly inserted two excerpts of the assessment reports as a presentation of the book. Upon the argument of chronology, VICAT made the Council's report appear first and, regarding the report to the Academy, he produced an excerpt, concerned with his own contribution, certified by the Perpetual Secretary DELAMBRE.

As a conclusion I'd like to choose the epigraph VICAT posted on the cover page of the Memoir: *"However respectable an authority in science and art may be, it can always be examined. One would never have taken a step towards the truth, if authority had always prevailed over reason."* Attributed to Charles PINOT DUCLOS, Perpetual Secretary of the *Académie française* from 1755 to 1772, it sounds like echoing the motto of the Royal Society (of London): "*Nullius in Verba*."

## References

[1] *Annales de Chimie et de Physique* (1817), vol. VI, Crochard, Paris, p. 420.

[2] de Parville H. (1877). *Causeries scientifiques*, vol. 16, J. Rothschild, Paris, p.279.

[3] Vicat L. (1817). Principaux résultats de diverses Expériences sur les Chaux de construction, les Mortiers et les Bétons. *Annales de Chimie et de Physique*, vol V, Crochard, Paris, 387-392.

[4] *Rapport fait à l'Académie royale des sciences sur un ouvrage de M. VICAT, ingénieur des ponts-et-chaussées, intitulé Recherches expérimentales sur les chaux de construction, etc...* Firmin Didot, Paris, 1819.

[5] VICAT L. J. (1818), *Recherches expérimentales sur les Chaux de construction, les Bétons et les Mortiers ordinaires* Goujon, Paris.

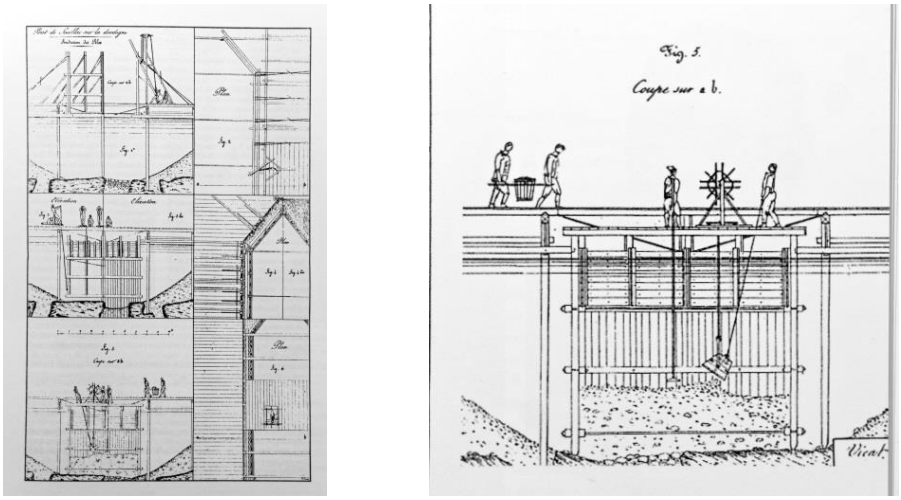



**Fig. 4. Drawings by Vicat**

L'importance du Mémoire de M. Vicat nous fait espérer que le compte qui vient d'en être rendu ne paraîtra pas s'étendre au-delà des bornes que nous devions nous prescrire. Cet ouvrage a fixé l'attention de vos commissaires, et par les faits nouveaux qu'il contient, et par la méthode et la clarté avec laquelle ils sont exposés. Les explications qui en sont données s'appuient sur les saines théories, et prouvent que l'auteur, quoique résidant dans un département éloigné de la capitale, s'est tenu constamment au courant des progrès des sciences dont il se montre très-capable de faire d'utiles applications. On ne peut manquer de concourir soi-même à leur avancement, quand, avec un esprit investigateur comme celui dont M. Vicat paraît doué, on entreprend d'éclairer de leurs lumières la pratique de l'art qu'on exerce. Les ingénieurs placés dans des circonstances semblables sur les dif-

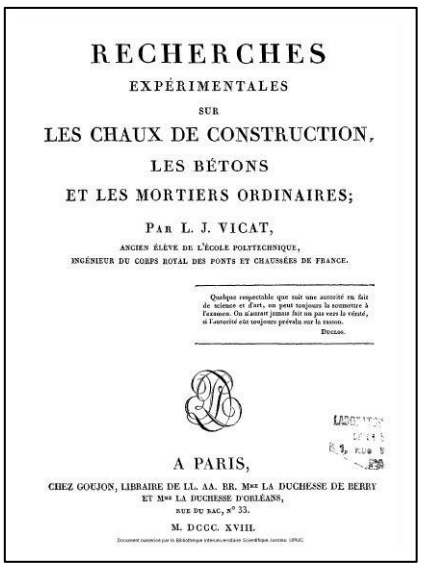
( 47 )

férents points du royaume, lui devront de la reconnaissance, et par les résultats du travail qu'il leur offre, et par l'exemple qu'il leur donne. Nous pensons que, sous tous les rapports, son ouvrage mérite d'être approuvé par l'Académie, et d'être inséré dans le recueil des savants étrangers.

Fait à l'Académie royale des sciences, le 16 février 1818.

DE PRONY ; GAY-LUSSAC.
GIRARD, *rapporteur.*

**Fig 4. Excerpt from *Rapport fait à l'Académie royale des sciences sur un ouvrage de M. VICAT…***



RECHERCHES

EXPÉRIMENTALES

SUR

LES CHAUX DE CONSTRUCTION,

LES BÉTONS

ET LES MORTIERS ORDINAIRES;

PAR L. J. VICAT,

ANCIEN ÉLÈVE DE L'ÉCOLE POLYTECHNIQUE,
INGÉNIEUR DU CORPS ROYAL DES PONTS ET CHAUSSÉES DE FRANCE.

Quelque respectable que soit une autorité en fait de science et d'art, on peut toujours la soumettre à l'examen. On n'aurait jamais fait un pas vers la vérité, si l'autorité eût toujours prévalu sur la raison.
DIDEROT.

A PARIS,

CHEZ GOUJON, LIBRAIRE DE LL. AA. RR. Mgr LA DUCHESSE DE BERRY ET Mgr LA DUCHESSE D'ORLÉANS, RUE DU BAC, n° 33.

M. DCCC. XVIII.

**Fig. 5. Vicat's Memoir**